

Process Specification for the Application of Fluoroelastomeric Coatings

Engineering Directorate

Structural Engineering Division



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National Aeronautics and
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Lyndon B. Johnson Space Center
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REVISIONS		
VERSION	DESCRIPTION	DATE
Baseline	Original version	5/95
A	Minor format changes; Formal training requirements deleted.	7/14/99
B	Reviewed and updated for accuracy; Author updated	7/30/99
C	General changes due to reorganization (changed EM to ES). Updated references in 7.0.	12/14/05
D	Minor format changes; Addition of a reference in 7.0	3/26/10

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1.0 PURPOSE

This specification provides requirements for the application of fluoroelastomeric coatings on various substrates. Fluoroelastomeric coatings are typically used for the protection of flammable materials or to reduce the generation of particulates on friable materials.

2.0 SCOPE

This specification applies to the application of fluoroelastomeric coatings to space flight and space flight-related hardware fabricated under the authority of the NASA/Johnson Space Center (JSC).

3.0 USAGE

This process specification shall be called out on the engineering drawing by identifying the surface(s) to be coated and using a drawing note with the following general format:

**FLUOROELASTOMERIC COAT WITH MATERIAL w
THICKNESS = $x \pm y$ mm
PER NASA/JSC PRC-4001, CLASS z**

The material callout shall be in accordance with Section 8.0, MATERIAL REQUIREMENTS. Nominal coating thickness (with applicable tolerances) shall not be less than 0.25 mm (10 mil) when the fluoroelastomeric coating is to be used as flammability protection.

The "class" descriptor shall conform to one of the following definitions:

- Class 1 Coating properties must be verified by test
- Class 2 Coating properties do not require verification by test

4.0 DEFINITIONS

None.

5.0 RECORDS, REPORTS, AND FORMS

Standard manufacturing records, reports and forms shall be used. Records of personnel qualified to perform fluoroelastomeric coating shall be maintained in accordance with SLP 4.18. The results of all coating inspection and adherence tests shall be documented in the part quality record.

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6.0 **SAFETY PRECAUTIONS AND WARNING NOTES**

Toxic and flammable solvents are used in this process. Appropriate safety precautions shall be documented in the detailed process instructions for implementing this process specification.

7.0 **REFERENCES**

The following references were used to develop this process specification:

SOP-007.1 *Preparation and Revision of Process Specifications*

JSC 8500C *Engineering Drawing System Requirements*

The following documents are called out as an extension of the requirements given in this specification:

Federal Specification TT-I-735 *Specification, Isopropyl Alcohol*

Federal Test Method No. 141 *Adhesion (Wet) Tape Test*

JHB 5322.1 *Contamination Control Requirements Manual*

NHB 8060.1

*Flammability, Odor, Offgassing, and
Compatibility Requirements and Test
Procedures for Materials in Combustion
Environments*

JSC SLP 4.18 Training

8.0 **MATERIALS REQUIREMENTS**

Specific/special tools, equipment, and materials shall be documented in the detailed process instructions for implementing this process specification.

9.0 **PERSONNEL TRAINING AND CERTIFICATION**

Personnel performing coating and quality control activities shall be adequately trained for fluoroelastomeric coating processes. Training shall involve each technician successfully coating at least three Class 1 test coupons for each Detailed Process Instruction (DPI) that addresses fluoroelastomeric coatings.

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10.0 PROCEDURE

10.1 POT LIFE OF COATING SOLUTIONS

Catalyzed coating mixtures (or solutions) shall not be used if excessive curing has occurred. Approved DPI's shall provide guidelines to prevent the violation of the coating compound's maximum allowable pot life .

10.2 ENVIRONMENTAL CONDITIONS

All coating operations shall be conducted in an area maintained at a temperature of 27°C (80°F) or cooler with a relative humidity not exceeding 60%. Proper operating conditions shall be verified and recorded on the Manufacturing Process Record (MPR) in the Detailed Process Instruction (DPI).

During production, steps shall be taken to minimize the contamination of materials. All critical surfaces in storage shall be protected against contamination by appropriate enclosures, packing, wrapping, etc. The application and curing must be performed in a Controlled Work Area (CWA) as defined in JHB 5322.1.

10.3 SUBSTRATE CLEANLINESS REQUIREMENTS

The substrate must be visibly clean and free of oils and grease prior to the coating process. All non-porous substrates shall be cleaned prior to the coating process with a clean, lint-free cloth dampened with isopropyl alcohol (Fed Spec TT-I-735, Grade B). Porous substrates shall be smooth and brushed clean of all loose particulates. Cleaned parts shall be handled only with clean, white, cotton, lint-free gloves.

10.4 MIXING OF COATING SOLUTION

Mixing shall be performed using a motorized mixer or shaker. Care should be taken to minimize the entrapment of air during mixing. Special safety precautions should also be taken with the mixing equipment if the coating mixture contains any flammable constituents.

10.5 COATING APPLICATION AND CURE

Class 1 coatings shall be applied by spraying the coating solution on the substrate at a known flow rate in such a manner that the applied thickness may be reasonably controlled. All other coatings shall be applied either by brushing or spraying. Coatings may be built up by using multiple passes or coats. Each pass or coat shall be allowed to dry sufficiently in order to preclude the trapping of excess solvents between individual

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passes or coats. Precautions shall be taken to ensure that newly applied coatings are sufficiently dried before being handled.

11.0 VERIFICATION REQUIREMENTS

11.1 TEST COUPONS (Class 1 only)

A single test coupon of the same substrate material shall be coated simultaneously with the actual hardware. The same batch of coating material shall be used for both the test coupon and the actual hardware.

11.2 COATING APPEARANCE

The coated area shall be visibly smooth and continuous. A maximum of 5% of the total coated area may be dominated by discolored, cratered, or spackled textures.

11.3 THICKNESS OF COATING (Class 1 only)

The thickness of the coating applied to test coupons shall be verified to satisfy the requirements of Section 3.0, USAGE, by means of a micrometer or other measuring device.

11.4 COATING ADHERENCE (Class 1 only)

Coating adherence shall be tested according to the following test method:

- a. Apply the coating to the substrate and allow to dry as specified in the applicable Detailed Process Instruction.
- b. Make two parallel scratches, 3.0 cm (1.2 inch) apart, through the coating to the substrate with a sharp instrument.
- c. Immediately apply a 2.5 cm (1.0 inch) wide strip of adhesive masking tape (Code No. 250, 3M Corp.; shelf life not to exceed 6 months) across the two scratches. Press the tape tightly and uniformly against the surface of the coating.
- d. Remove the tape with one quick motion.
- e. Coating adherence shall be acceptable if the coating does not visibly become separated from the substrate.

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